You cannot create or destroy energy. That is a basic law of physics: the law of conservation of energy. You can find energy in many different forms. You can turn it from one form to another form. If you have 100 units of energy at the start, you will still have 100 units at the end, no matter how you transform it or change it.

To transform energy, you need to find a way of making the conversion from form to form. That’s what our ancestors did when they discovered how to use fire for warmth and cooking, Starting with a resource such as wood, they burnt it to make fire. This was more useful that looking at the wood and wondering how to unlock the energy inside so that they could cook a steak.

Primary energy is the total energy contained in a resource. Around the world, we use non-renewable resources, including fossil fuels and uranium. We can estimate how much energy is available from these non-renewables.

Similarly, we can estimate the amount of energy available from renewable resources, such as the energy of water stored in a reservoir (ready to produce hydroelectricity), the energy of the wind, the energy arriving from the Sun or the biofuels – wood, straw, bagasse and dried dung.

We can estimate the total primary energy that is available at the moment. We can estimate the total primary energy we use every year. Consequently, we can estimate how many years it will be until our energy resources run out. The calculations lead us to think that the energy reserves of the planet cannot sustain the population forever.

Q1: What is the basic law of physics mentioned in this passage?

Q2: Give an example from this passage that shows energy can be changed, or transformed, from form to form.

Q3: What is primary energy?

Q4: What are the two main categories of primary energy? Give 2 examples of each.

Q5: What conclusion does the passage come to?

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Energy available to perform work is measured in **joules**. For example a Big Mac contains about 1920 Kilojoules (1920 x 1000 = 1 920 000 joules).

The energy from one joule is required to lift an apple 1 metre in the air in 1 second.

A person releases about 60 joules of energy as heat per second when resting.

The amount of energy being transformed per second is measured in **watts**. One watt is equal to one joule being transformed per second.

For example: a 50 watt light globe transforms 50 joules of electrical energy into 50 joules of heat and light energy every second.

How long could a Big Mac run a 50 watt light globe?

The light globe uses 50 joules every second.

This means that 1920000 ÷ 50 = 38 400

The light can run for 38 400 secs or

38 400 ÷ 60 = 640 minutes

Or 640 ÷ 60 = 10.67 hours

Q1: How many joules does a 1200 watt hairdryer convert every second that it is running?

If it runs for 60 seconds, how many joules does it use?

Q2: How many joules does a 400 watt, 50 inch plasma TV transform every second?

If you watch it for 2 hours, how many joules are transformed?

Q3: A litre of petrol contains 33 500 000 joules, if my car uses 5.5 litres per 100 km how many joules am I converting over 100 km? 50 km?

What energy transformations are taking place?

Q4: An average person produces about 210 watts per hour of riding a bike. How much chemical energy will I need to ingest so I can ride for 2 hours?

Q5: Why is a 15 watt LED downlight better than a 50 watt halogen, when they both give out the same light intensity?